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Attachment:

A Synopsis of the Keystone Pipeline Project Cultural Resources Research Design and Results for South Dakota.

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The purpose of this synopsis is to provide further documentation for the research design that was developed for this project, the process that was followed to gain approval from the South Dakota State Historic Preservation Office, and the level of effort and overall results of the field work conducted in 2006 and 2007.

The Research Design

The research designs used in North Dakota and South Dakota are virtually identical. An excerpt from the approved South Dakota research design follows:

The purpose of this document is to provide a research design for a cultural resource inventory of the proposed pipeline corridor in South Dakota, which will be implemented in 2006. The ideas and concepts underlying this document are the results of informal discussions with the SDSHPO Review and Compliance Officer Paige Hoskinson and ENSR International. This research/survey design is intended only for the inventory phase of the pipeline project. Issues such as open trench monitoring, site evaluative testing, and site mitigation/data recovery will be addressed following the inventory phase, in consultation among MAC, ENSR staff, and SDSHPO archaeologists.

Five levels of investigation are proposed for this project. The first, a literature and files search of the entire pipeline route covering a two mile wide corridor, is included within this document. The second is a reconnaissance of the route by a geomorphologist who will identify areas that may need closer investigation, and conversely areas that are not archaeologically sensitive. The third is a Level III intensive pedestrian survey. The fourth is a reconnaissance inventory by MAC archaeologist(s). The fifth, based on some of the above investigations is no survey. A sampling strategy, based in part on the results of a literature search (Level I records search) of the South Dakota Archaeological Research Center's site and manuscript files, is proposed. The sampling strategy also takes into account the various land forms, crossed by or adjacent to the corridor. Under this strategy an intensive pedestrian inventory of a 300' wide corridor, centered on the proposed pipeline centerline, will be undertaken along approximately 38.5 miles (17%) of the overall length in South Dakota. This inventory will include areas recognized to be archaeologically sensitive, including river crossings, and areas with documented sites, as determined by the Level I records search. There may be some small individual areas along glacial lake beach lines, fan alluvium, playa lakes, or other areas identified during geomorphological investigations. This additional inventory will probably total

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less than ten miles. Approximately 52 miles (23%) will be subject to a Class II reconnaissance level (drive-by) inventory. Most of this length will be covered during the geomorphological survey and some may not need re-walking. Metcalf Archaeological Consultants, Inc. will coordinate the Class II reconnaissance inventory with the geomorphological survey since each may provide useful information and observations to the other. The segments to be covered by the pedestrian inventory are depicted on the project corridor maps in Appendix B.

Discussion of Pre-Construction Identification Efforts

The sampling strategy used for the Keystone Project in North and South Dakota is based on standard practice in North Dakota (eg. Alliance Pipeline 1997) and on officially accepted practice in South Dakota. The South Dakota Historic Preservation Office *Guidelines for Cultural Resource Surveys and Survey Reports* (2005: 9) states Level II Sample Surveys "are conducted for linear projects such as roads, fiber-optic lines, telephone lines, electric power lines, and pipelines ... The principal investigator must justify a sample survey with a written proposal. SHPO must review and accept the proposed strategy in advance of the survey." Pursuant to this guidance, the *Research Design for the TransCanada Keystone Pipeline Cultural Resource Inventory in South Dakota* was submitted to the SHPO in 2006 and it was approved by SHPO on March 28, 2006 prior to the commencement of field work. A second review occurred on June 15, 2007. At that time Ed Stine and Dan Gredvig of MAC met with Paige Hoskinson (Review and Compliance Coordinator South Dakota State Historical Society) in part to discuss the research design/methodology for the project. At this meeting Ms. Hoskinson agreed that the research design was applicable for the project and its route changes. The sole change to the 2006 SHPO concurrence regarding prehistoric sites was the addition of one drainage crossing that had been overlooked in the original inventory plan. This drainage crossing (Wolf Creek) was subsequently inventoried with no resources being found.

The SHPO as well as federal guidance documents allow for selectively surveying only portions of linear projects in the Dakotas based upon the overall state of scientific knowledge about the areas. The cumulative experience of a large number of archaeologists working in a variety of terrains over a long period of time has shown that prehistoric sites are very unevenly distributed across the landscape. Few, if any sites are found on flat to gently sloping expanses located away from drainages. Sites tend to occur near water courses and in upland terrain where hills, buttes, and ridges provide some diversity in the environment as well as views of the surrounding terrain. Thus, the flat, featureless, and dry areas are often eliminated from the inventory. In essence the inventory selection strategy used for the Keystone Project relies on a model of human interaction with the land based on the entire suite of information known by the scientific community at this time. The use of such models to focus scientific exploration and discovery is widespread, represents the state of the practice at this time, and is appropriate for use on this project.

The design did not attempt to block out areas into High, Moderate, and Low potential. Use of these terms is informal, a shorthand that was adopted to ease communications. Areas with some potential for sites to occur are viewed as being of moderate or high potential, while areas where no sites are expected are termed low. In essence there is a dichotomy between the categories of "sites expected to occur" (moderate-high) and "sites not expected to occur" (low). In practice,

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the project corridor was laid out on topographic maps, and based on the results of the files search, on presence of topographical relief, or the presence of drainages within developed valleys or that flow year-round segments were determined to either have a moderate to high possibility for archaeological sites or a low potential. All areas with a moderate to high potential were selected for inventory. The project corridor was also subjected to a reconnaissance survey (drive by) in its entirety to determine if there were localized areas that should be included in the inventory.

The data supporting this model reflects knowledge gained by almost a century of observation on the part of Federal, State, private sector, and amateur archaeologists, as well as by information shared by Native American consultants over the last decade. The data are reflected in statewide site files, publications, contract reports, and in oral tradition. There is no implication that the general model is statistically based—it is not. Nor is there any implication that every archaeological resource will be found in the locations predicted by the model. The model assumes that one would find the vast majority of the surface sites in a linear project area by conducting pedestrian inventory using selective inventory based on the criteria discussed above.

Implicit in the use of any sampling strategy for locating archaeological sites, including 100% pedestrian inventory, is the possibility that some sites will escape detection. Factors such as vegetation cover, depth of burial, size and visibility of artifacts and features, patterns of sunlight and shadow, and many others can affect the reliability of pedestrian inventory. For that reason, a number of steps are built into the process of identifying, evaluating, and treating historic properties. These steps start with pre-field files and documents searches, include pedestrian inventory, sub-surface testing for the discovery of resources, and, once a project is under construction, include various monitoring procedures aimed at locating, evaluating, and treating sites that have not been identified during the pre-construction identification steps.

At the inventory step, the Keystone project used three cross-checks of the basic inventory selection methodology. First, if the files search indicated any information to contradict basic model expectations, that area would be added into the inventory. Second, a geoarchaeological reconnaissance was performed to assess landform potential for sensitivity for buried sites and for environments conducive to site preservation. Finally, an archaeological reconnaissance was performed so that the archaeologists could visually confirm the results of map-based sample selection. In summary, after consideration of all the factors for site occurrence (as well as modifications in the pipeline alignment to address landowner and construction issues), a total of 58.1 miles of the pipeline ROW were inventoried in areas where sites were expected.

In addition to the procedures for selecting areas for pedestrian inventory, a program of shovel testing in areas of moderate to high site expectations, but with poor surface visibility was also used. Several areas were subjected to shovel probing.

Finally, although not part of the original sampling strategy, a number of Fish and Wildlife easements located in areas where sites were not expected. These areas received pedestrian inventory as a result of that agency's Section 106 compliance policy for easement crossings. No cultural resources were found in any of these areas, which totaled well over 16 miles in North

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Dakota and about 12 miles in South Dakota. The negative results of pedestrian inventory in areas where sites are not expected helps confirm the reasonableness of the approach used for the cultural resource studies.

Survey Level of Effort and Results

Based on the research design outlined above, the following table summarizes the pedestrian survey efforts along the proposed Keystone Right of Way (ROW) during 2006 and 2007.

	Areas crossed by the proposed pipeline ROW in South Dakota where sites are expected to occur.	Areas crossed by the proposed pipeline ROW in South Dakota where sites are not expected to occur
Research Design inventory areas (miles)	38.5	180.4
Length of inventory along currently proposed pipeline ROW (miles)	35.9	9.7
ROW length surveyed in each site occurrence category in relation to the Research Design criteria (percent)	93	5
Survey Access denied (miles)	1.5	0
Length of Inventory on pipeline segments that were rerouted (miles)	22.2	2.3
Inventory Total (miles)	58.1	12.0

In 2006 two prehistoric isolated finds and three prehistoric sites were documented within the project corridor. In 2007 three isolated finds and one prehistoric site were documented. Two of the sites from the 2006 inventory were along the James River and the third adjacent to the Coteau des Prairie. The site documented in 2007 was along the James River and was documented during re-route efforts avoiding one of the 2006 sites. All of these resources are within areas judged to have potential for sites.